

## **REMARKS**

### **A. Status of the Claims**

Claims 1-12 and 14-70 were pending at the time of the last Office Action. Claims 36, 37, 52-60 and 67-70 have been canceled because they are drawn to a non-elected species. Claims 15, 32-34, 38, 40, 42 and 46-51 have amended for the reasons discussed below.

### **B. Telephone Conference with Examiner**

Applicants' representative Mark Garrett had a telephone conference with Examiner Kao on July 1, 2004. Applicants' representative argued that the proposed combination of Magnusson and Farah was improper. Examiner Kao did not agree to allow the claims. Examiner Kao asked if any of the figures showed a waveguide grating that included a waveguide layer and a grating layer that comprise the same layer. Figures 12, 14, 16 and 20 are all examples of such waveguide gratings (note the "Waveguide Grating" label in each).

### **C. Claims 1-12, 14, 38-40, 46 and 47 Are Patentable over Farah in view of Magnusson**

The Office rejects claim 1-12, 14, 38-40, 46 and 47 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,891,747 to Farah (Farah) in view of U.S. Patent No. 5,598,300 to Magnusson et al. (Magnusson). Applicants respectfully traverse.

#### **1. Claims 1-12 and 14 are Patentable over Farah in view of Magnusson**

Claim 1 is directed to a waveguide grating device comprising a waveguide grating fabricated on the endface of at least one waveguide. The waveguide grating is composed of at least one waveguide layer and at least one grating layer.

The Office asserts that it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have "the same layer grating" or "the different layer grating" of Magnusson with the device and method of Farah. Final Action at pages 3-4. The

Office asserts that the gratings of Farah and Magnusson are “considered equivalent structures known in the art, and one of ordinary skill in the art would have found it obvious to substitute one grating for another.” *Id.* The Office asserts that the motivation for the asserted combination would be the “significantly improved filter characteristics [of Magnusson].” Final Action at pages 3-4.

The Office’s assertions are not correct because the proposed combination would change the principle of operation of Farah. Though both Magnusson and Farah incorporate a grating, the purpose of the grating in each reference is not the same. Broadly, Farah is concerned with, in relevant part, passing along diffracted orders **other than** the zeroth order to an adjacent waveguide. By contrast, Magnusson is concerned with propagating **only** zeroth orders. To combine Magnusson’s teachings with those of Farah would render Farah useless. Accordingly, the Office has not carried its burden of establishing a *prima facie* case of obviousness with respect to claim 1.

**a. Farah**

Farah discloses, in relevant part, an extrinsic interferometric displacement sensor that produces phase modulation. Col. 3, lines 58-62. Displacement ( $y$ ) of a fiber cantilever is calculated by measuring the phase change experienced by light as it passes through a gap between the fiber cantilever (element 6 in FIGS. 4A and 4B) and a fixed fiber (element 5 in FIGS. 4A and 4B) a short distance away. Col. 6, lines 28-41. The phase change is proportional to the optical path length ( $P$ ) in the gap between the fixed and cantilevered fibers. Col. 7, line 22. It is the goal of Farah to effect linearity between the change in the path length ( $P$ ) and the displacement ( $y$ ) of the fiber cantilever. Col. 5, lines 44-45.

Farah notes that an obstacle to such a device is that the motion of the cantilever fiber is transverse to its neutral axis, and thus has no component along the direction of propagation of light in the gap. Col. 5, lines 52-57. A measurable phase change does not occur because negligible path length change is produced. Col. 5, lines 59-61. Farah purports to address this problem, in relevant part, by using a diffraction grating to redirect the light through the gap at a substantial angle ( $\theta$ ) relative to the neutral axis of the cantilevered fiber. Col. 8, lines 32-37; *see also* col. 7, lines 3-5 (discussing need to direct light at substantial angle through gap). This angle ( $\theta$ ) produced by the grating provides a common directional component between the displacement of the cantilevered fiber and the propagation of the light in the gap. Col. 5, lines 62-67; col. 6, lines 1-2. This angle ( $\theta$ ) is crucial to the success of the sensor, as a higher angle ( $\theta$ ) yields higher device sensitivity. Col. 7, lines 12-25.

As shown in FIGS. 4A and 4B of Farah, the grating 31 yields many diffracted orders 33, 35, 38. Col. 8, lines 36-38. One of the orders not aligned with the waveguide axis 7 (*i.e.*, orders 35 or 38) is picked up by the other fiber 5. Col. 8, lines 38-40. The zeroth order(s) (*i.e.*, the order(s) aligned with the axis of the waveguide) is not passed along. Therefore, the diffracted orders 35, 38 other than the zeroth order 33 **are necessary** for the light to couple from one fiber end 1' to the other fiber end 1" across gap 4, a crucial function of Farah. Col. 5, lines 15-19. These non-zeroth diffracted orders provide the directional component common to the displacement of the cantilevered fiber necessary for operation of the device.

**b. Magnusson**

Magnusson discloses an ideal or near ideal reflective filter having no or very low sidebands. Col. 2, lines 17-23. This is achieved by using a waveguide grating, which produces guided-mode resonance effects leading to low sidebands. Col. 2, lines 17-23. Therefore, the

grating in Magnusson is designed “so that only the zero-orders propagate,” higher-order diffracted waves, also known as sidebands, are eliminated. Col. 4, lines 62-67.

**c. The Asserted Combination is Improper**

To combine the teachings of Magnusson with those of Farah would change the principle of operation of Farah’s device so as to make it virtually useless. If an ideal or near ideal filter as disclosed by Magnusson was used with the device and method in Farah, only the zeroth-order diffracted wave would be transmitted. That zeroth-order wave would not include the critical directional component common to the displacement vector of the waveguide tip that is necessary for the success of Farah’s device. Thus, Farah’s device would be virtually useless. “If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” MPEP § 2143.01 at 2100-127 (citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)).

Accordingly, the obviousness rejection of claim 1 should be withdrawn and the claim should be issued. Claims 2-12 and 14 depend from claim 1, and are patentable over Farah in view of Magnusson for the same reasons as claim 1. Accordingly, the obviousness rejection of claims 2-12 and 14 should be withdrawn and those claims should also be issued.

**d. Analysis of Office’s Rebuttal Arguments**

The Office states on pages 9-10 of the final Action:

[T]he motivation to combine the waveguide layer of Magnusson into Farah still holds since the waveguide layer in between the grating layer and the other medium for traversing a light beam to the grating is still useful in providing a means for efficiently sending the light beam from that medium to the grating (Abstract) as implied from Magnusson regardless of the diffraction order. Although Magnusson seems to be more concerned with zero-order diffraction, it would have been an obvious modification to use the waveguide layer and grating

for other diffraction orders (col. 16, lines 20-25)<sup>1</sup> as implied from Magnusson. Thus, it would have been obvious, to one having ordinary skill in the art, to incorporate the waveguide layer of Magnusson with the device of Farah.

If the Office is suggesting adding a waveguide layer to the device of Farah based on Magnusson, that suggestion fails to establish a *prima facie* case of obviousness. There is no motivation for adding a waveguide layer to Farah's multiorder diffraction grating, regardless of how "efficiently" light is transmitted through the added waveguide layer. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 682 (Fed. Cir. 1990). The Office asserts that Magnusson implies that his waveguide grating device is useful in propagating diffraction orders other than zero. However, to achieve the "significantly improved filter characteristics" of Magnusson to which the Office refers in its main argument (see pages 3 and 4 of final Office Action), a subwavelength diffraction grating is required. *See* col. 4, lines 62-67. Merely adding a waveguide layer to Farah's multiorder diffraction grating would not create Magnusson's high efficiency filter.

**2. Claims 38-40, 46 and 47 are Patentable over Farah in view of Magnusson**

Claim 38 is directed to a method of forming a waveguide grating device comprising fabricating a waveguide grating on the endface of a waveguide to form the waveguide grating device. Claim 38 has been amended to make explicit that the waveguide grating having at least one waveguide layer and at least one grating layer. The scope of claim 38 has not changed by this amendment, but the amendment was made nonetheless to expedite prosecution and minimize costs. Claims 40, 42, and 46-51 have been amended to comport with the amendment to claim

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<sup>1</sup> Examiner Kao explained during the telephone conversation with Applicants' representative that the citation was meant to be to col. 6, lines 20-25.

38. Claim 38 is patentable over the asserted combination of Farah in view of Magnusson for the reasons given above.

Claims 39-40, 46 and 47 depend from claim 38, and are patentable for the same reasons. Accordingly, the obviousness rejection of claims 39-40, 46 and 47 should be withdrawn and those claims issued.

**D. Claims 15-19, 22-32, 34-35 and 61-66 Are Patentable over the Asserted Combination**

The Office rejects claims 15-19, 22-32, 34-35 and 61-66 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson and U.S. Patent No. 6,191,890 to Baets et al. (Baets). Applicants respectfully traverse.

**1. Claims 15-19, 22-32, 34 and 61-62 are Patentable over the Asserted Combination**

Claim 15 has been amended to recite that it is directed to a generic system, and not a system for spectral filtering that utilizes a guided-mode resonance effect in a waveguide. The system comprises a waveguide grating device that includes at least one waveguide and a waveguide grating fabricated on the endface of the at least one waveguide. The waveguide grating comprises at least one waveguide layer and at least one grating layer. Claims 32-34, which depend from claim 15, have been amended to recite different configurations for the claimed waveguide grating such that different sensors are achieved.

The Office, relying on the combination of Farah in view of Magnusson, asserts that Baets teaches grating fill factor as a variable parameter and Magnusson further teaches a grating period less than the wavelength of the signal. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Baets does not cure this deficiency. Therefore, the claim is patentable over the asserted

combination. Accordingly, the obviousness rejection of claim 15 should be withdrawn and the claim should be issued.

Claims 16-19, 22-32, 34 and 61-62 depend from claim 15, and are patentable for the same reasons. Accordingly, the obviousness rejection of claims 16-19, 22-32, 34 and 61-62 should be withdrawn and those claims issued.

**2. Claims 35 and 61-66 are Patentable over the Asserted Combination**

Claim 35 is directed to a waveguide grating device comprising a waveguide grating fabricated on the endface of at least one waveguide, where the waveguide grating includes at least one waveguide layer and at least one grating layer.

The Office, relying on the combination of Farah in view of Magnusson, asserts that Baets teaches grating fill factor as a variable parameter and Magnusson further teaches a grating period less than the wavelength of the signal. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Baets does not cure this deficiency. Therefore, the claim is patentable over the asserted combination. Accordingly, the obviousness rejection of claim 35 should be withdrawn and the claim should be issued.

Claims 63-66 depend from claim 35, and are patentable for the same reasons. Accordingly, the obviousness rejection of claims 63-66 should be withdrawn and those claims issued.

**E. Claim 20 Is Patentable over the Asserted Combination**

The Office rejects claim 20 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson, Baets and U.S. Patent No. 4,753,529 to Layton (Layton). Applicants respectfully traverse.

Claim 20 depends from claim 19 above. The Office, relying on the combination of Farah in view of Magnusson and Baets, asserts that Layton teaches a detector comprising silicon. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Neither Baets nor Layton cure this deficiency. Therefore, the claim is patentable over the asserted combination. Accordingly, the obviousness rejection of claim 20 should be withdrawn and the claim should be issued.

**F. Claim 21 Is Patentable over the Asserted Combination**

The Office rejects claim 21 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson, Baets and U.S. Patent No. 4,533,247 to Epworth (Epworth). Applicants respectfully traverse.

Claim 21 depends from claim 19 above. The Office, relying on the combination of Farah in view of Magnusson and Baets, asserts that Epworth teaches a detector comprising a human eye. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Neither Baets nor Epworth cure this deficiency. Therefore, the claim is patentable over the asserted combination. Accordingly, the obviousness rejection of claim 21 should be withdrawn and the claim should be issued.

**G. Claim 33 Is Patentable over the Asserted Combination**

The Office rejects claim 33 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson, Baets and U.S. Patent No. 5,442,169 to Kunz (Kunz). Applicants respectfully traverse.

Claim 33 has been amended as described above, and now depends from claim 15. The Office, relying on the combination of Farah in view of Magnusson and Baets, asserts that Kunz teaches a detector comprising an electrochemical sensor. Even accepting this is as true for the



sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Neither Baets nor Kunz cure this deficiency. Therefore, the claim is patentable over the asserted combination. Accordingly, the obviousness rejection of claim 33 should be withdrawn and the claim should be issued.

**H. Claim 41 Is Patentable over the Asserted Combination**

The Office rejects claim 41 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson and U.S. Patent No. 5,863,449 to Grabbe (Grabbe). Applicants respectfully traverse.

Claim 41 depends from claim 40 above. The Office, relying on the combination of Farah in view of Magnusson, asserts that Grabbe teaches dipping. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Grabbe does not cure this deficiency. Therefore, the claim is patentable over the asserted combination. Accordingly, the obviousness rejection of claim 41 should be withdrawn and the claim should be issued.

**I. Claims 42-44 Are Patentable over the Asserted Combination**

The Office rejects claims 42-44 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson, Grabbe and International Publication No. WO 97/47997 to Hobbs (Hobbs). Applicants respectfully traverse.

Claims 42-44 depend from claim 41 above. The Office, relying on the combination of Farah in view of Magnusson and Grabbe, asserts that Hobbs teaches holographic interferometry or photolithography patterning. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Neither Grabbe nor Hobbs cure this deficiency. Therefore, the claims are patentable over the asserted

combination. Accordingly, the obviousness rejection of claims 42-44 should be withdrawn and those claims issued.

**J. Claims 45 and 48 Are Patentable over the Asserted Combination**

The Office rejects claims 45 and 48 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson and U.S. Patent No. 5,291,574 to Levenson et al. (Levenson). Applicants respectfully traverse.

Claims 45 and 48 depend from claims 40 and 38 above. The Office, relying on the combination of Farah in view of Magnusson, asserts that Levenson teaches spin coating or sputtering. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Levenson does not cure this deficiency. Therefore, the claims are patentable over the asserted combination. Accordingly, the obviousness rejection of claims 45 and 48 should be withdrawn and those claims issued.

**K. Claims 49-51 Are Patentable over the Asserted Combination**

The Office rejects claims 49-51 under 35 U.S.C. § 103(a) as being obvious over Farah in view of Magnusson and U.S. Patent No. 6,096,127 to Dimos et al. (Dimos). Applicants respectfully traverse.

Claims 49-51 depend from claim 38 above. The Office, relying on the combination of Farah in view of Magnusson, asserts that Dimos teaches thermal evaporation, electron-beam evaporation, or liquid phase epitaxy. Even accepting this is as true for the sake of argument, Farah in view of Magnusson fails to establish a *prima facie* case of obviousness as recited above. Dimos does not cure this deficiency. Therefore, the claims are patentable over the asserted combination. Accordingly, the obviousness rejection of claims 49-51 should be withdrawn and those claims issued.

**L. Petition for Extension of Time**

Pursuant to 37 C.F.R. § 1.136(a), Applicants petition for an extension of time of two months up to and including July 19, 2004 in which to respond to the final Office Action dated February 17, 2004. Pursuant to 37 C.F.R. § 1.16 and 1.17, a check in the amount of \$210 is enclosed, which is the process fee for a two-month extension of time. If the check is inadvertently omitted, or should any additional fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to the enclosed materials, or should an overpayment be included, the Office is authorized to deduct or credit the appropriate fees from or to Fulbright & Jaworski Deposit Account No.: 50-1212/UTSL:058US/MTG.

**M. Conclusion**

Applicants respectfully submit that claims 1-12, 14-35, 38-51 and 61-66 are in condition for allowance. Should the examiner have any questions, comments, or suggestions relating to this application, he is invited to contact the undersigned attorney at (512) 536-3031.

Respectfully submitted,



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Date: July 19, 2004